## REMARKS

### Amendments

Claims 1-12 have been examined. Claims 1, 2, 4, 10-12 have been amended. New claims 14-18 have been added. Reconsideration of the claims, as amended, is respectfully requested.

### Arguments in support of amendments

*Claim 1, 12 and 13*

The examiner objected that claim 1 was anticipated by US 5,593,509 (Zuppero) and US patent application 2006/0107995 (Kovacik).

Claim 1 defines a micro TPV generator that comprises, among other things, a "combustion chamber comprising an internal chamber with an expansion step configured to generate a significantly even temperature distribution on an outer wall of the combustion chamber". The feature of having an expansion step in the internal chamber to generate a significantly even temperature distribution on an outer wall is a novel and inventive feature of the present invention. Neither Zuppero or Kovacik describe such a micro TPV generator.

The present invention comprises an expansion step in the internal chamber of the combustion chamber, such as shown in Figures 2 and 3. This step modifies the combustion pattern within the chamber, which among other things, provides a significantly even temperature distribution on an outer wall of the combustion chamber. This effect improves the performance of the combustion chamber. The description of the present application clearly discusses the combustion pattern, for example in paragraphs 40 – 50, in paragraphs 59-62, and in relation to Figures 13a-15.

Zuppero does not describe such a feature. In particular, this document makes no mention of the internal chamber having an even temperature distribution on an outer wall, nor mentions the significance of such a feature. Further, Zuppero does not describe an expansion step in the internal chamber. Nor does it describe the beneficial effect that an expansion step

would have in creating an even temperature distribution on the outer wall of the combustion chamber.

Similarly, Kovacik does not describe producing a significantly even temperature distribution on an outer wall of the combustion chamber. Further, Kovacik does not disclose using an internal chamber with an expansion step to, among other things, alter the combustion pattern to create a significantly even temperature distribution on the outer wall.

We note the examiner's comments in relation to existing claim 4, that Kovacik shows a cylindrical outer wall for the combustion chamber and a backwards facing step. We submit that Kovacik does not include an expansion step in an internal chamber of the combustion chamber. For example, with reference to Figure 3 the combustion chamber of Kovacik comprises a burner with an internal tube that does not comprise any such step.

Further, Kovacik does not describe any step for the purpose of altering the combustion pattern in an internal chamber to improve performance by creating a significantly even temperature distribution on the outer wall.

We therefore submit that claim 1 is novel and inventive over Zuppero and Kovacik. Claims 2-12 depend from claim 1 and are distinguishable for at least the same reasons. Claim 18 also defines and expansion step, and therefore is novel and inventive for the same decisions.

Claims 13 and 14 provide further definitions of the nature of the expansion step. Zuppero and Kovacik do not describe an expansion step, as submitted above.

Following this, they do not describe expansion steps with the particular geometries defined in claims 13 and 14.

*Claim 15*

Claim 15 defines a micro TPV generator in which the photovoltaic cell is fabricated from one or more of InGaSb or InGaAsSb. None of the cited documents disclose a micro TPV generator with a photovoltaic cell fabricated from either of these materials. Therefore, claim 15 is novel and inventive for this reason and for its dependency from claim 1.

*Claims 17 and 17*

Claim 16 defines a micro TPV generator comprising a micromixer for pre-mixing fuel and air, wherein the micromixer is coupled to the combustion chamber. The microcombuster (combustion chamber) comprises porous material for transmitting excess heat from the combustion process back to the micromixer to preheat the air and fuel entering the combustion chamber. Porous media is particularly effective for this heat transfer.

Claim 17 defines a micro TPV generator wherein the porous material of the microcombuster is formed from SiC.

Figure 1 and paragraph 38 of the present application show the micromixer and also show the microcombuster combustion chamber coupled to the micromixer in order to transfer heat to the micromixer. Further, paragraph 51 describes that the microcombuster can be made of an emitting material such as SiC. SiC is a porous material. Using a porous material to transfer heat back to the micromixer enhances the radiation efficiency of the microcombustion significantly, thereby improving the overall efficiency of the micro TPV system. The regenerative internal heat feedback results in high burning speeds, extension of the lean flammable limit and the ability to burn fuels that have a low energy content.

Further, employing a porous media can prolong the residence time of mixed gas, which is important for combustion on a micro scale.

This feature allows a wider range of fuels other than hydrogen to be employed as the heat source and for a higher and more uniformed temperature distribution on the surface of the microcombuster. Therefore, the output power density of a micro TPV system with a porous microcombustor chamber that is coupled to the micromixer can significantly increase the output power density.

The feature of using a porous microcombustor chamber that is coupled to a micromixer is therefore novel and inventive over the cited documents. None of the cited documents disclose the combination of a porous microcombustor chamber coupled to a micromixer in a micro TPV generator with an expansion step.

*Claim 2*

We submit that claim 2 is novel and inventive through use of the platinum catalyst. We note the examiner's comment that it would be obvious to take the platinum catalyst coating from US patent 6,786,716 (Gardner) and apply this to the combustion chamber of the Kovacik microcombuster, to arrive at the invention defined in claim 2. We submit that it is not obvious to put a platinum catalyst on a micro TPV combustion chamber in view of these documents.

First, using the platinum catalyst as described in Gardner would not achieve the same effect of the catalyst in the present invention. Further these documents relate to a different field and should not be combined for obvious reasons.

The platinum catalyst employed on the inside walls of the combustion chamber of Gardner is used for a different purpose to the present invention, and operates in a different manner to obtain a different end. More particularly, the platinum catalyst in Gardner is used to create a surface reaction to generate moderate temperatures to get a stable flame and moderate temperature distribution. This allows the Gardner microcombuster to be used for onchip thermal management and for sensors.

For example, we refer the examiner to column 3, lines 12-15 of Gardner, where it states that the heated catalyst enables flame stabilisation and allows the combustion temperature. We further refer the examiner to column 8, lines 55-63 where it states that the catalyst has the advantages of enabling low-temperature combustion of gases and promoting stabilisation of the flame. Further, in column 11, lines 28-37 and Figures 7a and 7b, the specification describes/repicts the power change of the platinum catalyst, including a low-temperature surface reaction that is reaction rate limited. These diffusion limited surface reactions predominate at intermediate temperatures.

The platinum catalyst in Gardner is being used for a quite different purpose than the present invention. The present invention uses gaseous combustion in the main combustion chamber to obtain the high and uniform temperature distribution along the wall. The surface

reaction platinum catalyst mentioned in Gardner is not suitable for application in the present application, nor in the Kovacik microcombuster.

Also, Gardner describes a microcombuster relating to a different field of technology. It relates to a microhot plate microcombuster, rather than the type of the present invention. It belongs to a different field of technology, and it would not be obvious to take this platinum catalyst described for use in the present invention.

First, actually taking the catalyst would not work, as it is only described for working at low-temperatures. Further, one skilled in the art would not consider doing this, because of the different purpose for the Gardner platinum catalyst and the different field of technology to which it relates.

In addition, we also submit that Kovacik relates to a different area of technology. It relates to macro TPV devices, rather than micro TPV devices. For example, we refer to paragraph 17 of Kovacik where the application discusses the power densities of the device. These are power densities commensurate with macro TPV devices. Micro TPV devices have significantly higher power densities. For example, we refer you to the values set out for macro and micro TPV devices in paragraph 36 of the present application US 2005/0121069. The issues that arise in making an operating micro TPV device are significantly different to those in a macro TPV system.

Therefore, Gardner and Kovacik relate to different areas of technology and would not be combined by those skilled in the art. Further they are different to the field of the present invention and would not be considered for solving the problems addressed by the present invention. Therefore, claim 2 is novel and inventive. The skilled person would not combine these two documents.

## CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 303-571-4000.

Respectfully submitted,

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